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SCIENCE NEWS LETTER

THE WEEKLY SUMMARY OF CURRENT SCIENCE



Fiery Silicon

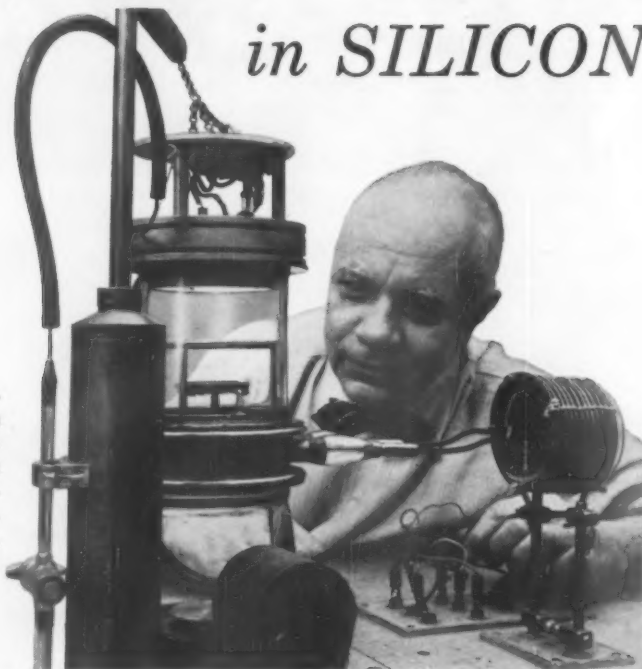
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A SCIENCE SERVICE PUBLICATION

AN ADVENTURE

in SILICON

One example of junction technology at Bell Laboratories. Here a junction is produced on the surface of silicon by bombardment with alpha particles. Bombardment enhances silicon's performance at very high frequencies.



One day in the 'thirties a revolutionary adventure began for Bell scientists. They were testing an experimental silicon crystal they had grown to make microwave detectors.

Intriguingly, they found that one end of the crystal conducted by means of positive charges, the other end with negative. Positive and negative regions met in a mysterious barrier, or junction, that rectified, and was sensitive to light. It was something entirely new . . . with challenging possibilities.

The scientists went on to develop a theory of junction phenomena. They showed that two junctions placed back-to-back make an amplifier. They de-

vised ways to make reproducible junctions. Thus, junction technology came into being, and the 20th Century had a new horizon in electronics.

This technology has already produced at Bell Telephone Laboratories the versatile junction transistor (useful in amplifiers and switches); the silicon alloy diode (surpassingly efficient in electronic switching for computers); and the Bell Solar Battery which turns sunshine directly into useful amounts of electric current.

This is one of many adventures in science which make up the day-to-day work at Bell Laboratories . . . aimed at keeping America's telephone service the world's best.



Bell Telephone Laboratories

*Improving telephone service for America
provides careers for creative men in scientific and technical fields*

GENETICS

Atomic Heredity Damage

Nobelist H. J. Muller warns denial of atomic damage to future populations weakens morale. Even Pacific tests plant thousands of harmful mutations in population.

► DENIALS OF damaging hereditary effects by atomic radiation "weaken public morale and open the door for defeatist propaganda," Indiana University's Prof. H. J. Muller, Nobel Prize winning geneticist, told the National Academy of Sciences in Washington upon the occasion of receiving one of the two recently established Kimber genetics awards.

"So many people are already aware of the damaging action of radiation on heredity," he said, "that these attempts in high places to disclaim the danger cause the public to lose confidence. On the recoil, the public then becomes more likely to swallow another widely circulated counterclaim that the hereditary constitution of all of humanity is being seriously undermined by our tests of hydrogen bombs and that the tests should be stopped for this reason. In my view this claim is equally false."

The Nobel Prize in medicine for 1946 was awarded Prof. Muller for proving that X-rays produce mutations, or changes in the genes, the heredity controlling factors in reproductive cells.

Prof. Muller disputed recent claims that radiation, even in such quantity as that to which the people of Hiroshima were exposed by the atomic bomb, would cause no damage to later generations.

"The group of responsible scientists," he said, "who in 1953 signed the official report on investigations of the Hiroshima-Nagasaki after-effects, stated that it had 'always been doubtful whether significant findings' could be obtained by the methods there used. They pointed out that the inconclusive results, while not definitely positive, were at the same time 'entirely consistent with what is known of the radiation genetics of a wide variety of other material.'"

"In other words, there could well have been as many harmful mutations produced in these human populations, but lying undetected, as experiments with other animals have shown to be produced in them by such exposure."

"The numerous disabilities and deaths among Hiroshima survivors will be spread out very thin over a large number of generations. The effect in any one individual usually will be slight, although enough finally to extinguish his line of descent. Therefore, the overall cost, although great, will be too scattered and insidious to affect the population as a whole noticeably."

Prof. Muller attacked recent assertions that heavy exposures of human beings to radiation may even result in their descendants being benefited.

"This sort of thing," he said, "has been found to occur in fruit flies irradiated

heavily for generations because, in fruit flies, it is the usual thing for more than 100 young to die for every one that survives. Thus the many flies inheriting a weakened heredity tend to die out fairly quickly.

"They could be replaced by the rapid multiplication of the extremely rare beneficial mutations that were produced. But in a human population such a situation would be ruinous."

Referring to the H-bomb tests in the Pacific, Prof. Muller said: "The Atomic Energy Commission has recently stated that the radiation received by the average American from these tests to date is only about as much as is received from a chest X-ray, or one-tenth of an r-unit. Since there were 160 million people receiving this H-bomb radiation, as compared to the 160,000 persons who survived Hiroshima after getting a thousand times this dose, there must have been about as many mutations in both areas."

Figures showing that this amount of radiation could lead to tens of thousands of harmful mutations inherited by the next generation were cited.



ATOMIC COMPACT — This case, no larger than a rouge compact, was designed to measure radiation at the Atomic Energy Commission's test site in Nevada. Glass in the lower half of the unit is radiation sensitive.

"However, relatively to the size of the two populations," he said, "the effect is only a thousandth as great in the U.S.A. as a whole as was concentrated in Hiroshima. This certainly does not undermine the heredity of our population as a whole significantly."

"Each individual harmful mutation is, however, an evil, and we have no right to dismiss it lightly. Therefore we must base our case for the continuance of the tests squarely on the fact that they are at the present stage necessary to prevent our being put at a military disadvantage. Only from a position of all around strength, I think, can we finally reach a situation where general disarmament is feasible."

"The same kind of reasoning justifies the use of carefully controlled X-rays and radioactivity in medicine. That is, the genetic damage should be admitted and weighed against the benefits. But a recent survey shows that Americans are receiving much more radiation in these ways than as a result of all atomic and hydrogen test explosions."

"Most of the genetic damage from medical uses of radiation could be avoided if only physicians would admit its existence and take certain simple precautions to reduce it, such as shielding the reproductive organs, and limiting and keeping track of the total amount of exposure of each patient over many years."

"It is largely this reckless attitude on the part of physicians which has influenced extremists to claim that nuclear explosions are harmless or even beneficial."

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PUBLIC SAFETY

Asphalt Mat to Reduce Atomic Test Fall-Out

► A NEW safety feature for protection against radioactive fall-out, now a much dreaded result of nuclear weapons, is being tested in Operation Cue atomic test.

It is the new asphalt base to the tower where the nuclear device is set off. It points up the dilemma authorities face.

The asphalt base is being tested in the hope that it holds together the very light soil particles like those of Frenchman Flat's dry lake bed so that less of them will float off in the mushroom cloud.

It is hoped that the asphalt base will result in lumps rather than particles of soil and that these lumps will either stay on the ground or fall out very quickly to the test site or nearby bombing range.

This will give greater protection to populations in the fall-out area, an expanse that may grow larger and larger as more powerful nuclear weapons are tested.

Radioactive fall-out has led to a new type of shelter, one with exit door. This is for use in basements. Heretofore doors have not been recommended because of the increased danger in case of blast. One shelter with and one without doors are being tested side by side in the current detonation.

Science News Letter, May 7, 1955

AGRICULTURE

No Surpluses by 1975

► **TROUBLESOME FARM** surpluses of today may be a much desired but unavailable commodity by 1975, a Government land reclamation expert told the International Arid Lands Meeting in Albuquerque, N. M.

In a strong attack on those who advocate reducing the amount of water given to irrigation because we have surpluses, L. N. McClellan, assistant commissioner and chief engineer of the Bureau of Reclamation at Denver said, "crop surpluses should not be considered a serious liability so long as there are human beings on the edge of starvation anywhere in the world."

Calling the nation's recent years of crop surpluses "transient," Mr. McClellan said that without "unceasing efforts in the direction of expansion, by 1975 our surpluses as we know them today will disappear simply under the impact of increasing population in the United States itself."

Citing the fact that "shifting sands and whirlwinds of dust" have not prevented the arid West from supporting a population of

38,000,000 people, the West's reclamation chief credited the energies of man and his skills in science with creating undreamed-of crop, livestock and industrial wealth.

He noted that of the 42,000,000 western acres "susceptible to irrigation," only 25,000,000 are being watered. It is essential, he pointed out, that the other 17,000,000 be irrigated too.

But adding more cultivated acreage is not enough, Mr. McClellan stated. Better use of water resources must be made.

To accomplish this end, scientists and engineers are busy trying to cut losses from evaporation by coating water surfaces with compounds, such as household detergents, that in effect seal in the water with a barrier of molecules. Others are working on new and effective methods for controlling water-sapping desert plants.

It is estimated, the Colorado expert said, that evaporation and parasitic plants sop up 35,000,000 acre-feet of water a year, or almost half the 78,000,000 used for irrigation.

Science News Letter, May 7, 1955

METEOROLOGY

Hemispheric Rain-Making

► **INFLUENCING WEATHER** on a continent- or hemisphere-wide basis rather than only over a few miles may be the "most effective" use of cloud seeding, the Australian radio-physicist Dr. E. G. Bowen told the International Arid Lands meetings in Albuquerque, N. M.

"One of the most important factors controlling rain formation," he suggested, is meteoric dust floating down through the earth's atmosphere. The meteoric particles act as nuclei on which raindrops condense.

If this is correct, Dr. Bowen said, the atmosphere is "much more free from rain-forming nuclei than has previously been supposed."

This conclusion would have a profound effect on efforts to control weather artificially, a subject of great interest to farmers everywhere, particularly those living in the arid and semi-arid areas that cover one-third of the world's land mass.

Effects of meteoric dust sifting 60 miles or so toward earth are "very much greater" than was once thought, Dr. Bowen, director of the radiophysics laboratory of the Commonwealth Scientific and Industrial Research Organization, suspects.

Recent studies have shown, he said, that 29 or 30 days after the earth enters a major meteor stream, if rain falls at all, the chances are good that the rainfall will be a heavy one. (See SNL Jan. 23, 1954, p. 55.)

This may be due to "effects of meteoric dust falling into cloud systems in the lower atmosphere, the time difference of 30 days" being approximately that required for this

dust to drift down to the height where cloud tops are found.

Concerning present cloud seeding operations, usually carried out by throwing silver iodide into the atmosphere from smoke generators on the ground, Dr. Bowen said "rainmakers have produced more controversy than they have rainfall."

He pointed out that although silver iodide is highly effective as a freezing nucleus in the laboratory, generators on flat terrain often do not send workable shots of it high enough, 15,000 to 20,000 feet, or far enough to do much good. (See SNL Feb. 6, 1954, p. 86.) Dr. Bowen suggested that experiments be tried in which silver iodide is sprayed from airplanes and high mountain tops.

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GENERAL SCIENCE

"Safety Grain" Cuts Skidding on Wet Roads

► **CARS TRAVELING** 30 miles per hour can stop in two-thirds the usual distance on wet slippery asphalt roads when a "highway safety grain" is applied, tests have shown.

The grain particles are made of tough, fused alumina abrasive material with a hardness of over 2,000 on the Knoop scale, as compared to 850 for quartz and flint.

According to a report by C. E. Larson of the Bureau of Public Roads, highway surfaces become polished and slippery in places where traffic is heavy, where acceleration or

deceleration is great and at curves. The situation is made worse by the application of sand and cinders during the icy season. These particles may act as a buffing compound and increase road slickness.

The new safety grain was tested on a section of an asphaltic-coated highway west of Buffalo, N. Y., and the stopping distance on the wet surface was reduced from 100.4 feet to 68.8 feet for a car traveling at 30 miles an hour.

The findings were reported to the Highway Research Board in Washington.

Science News Letter, May 7, 1955

The beaver is the largest North American rodent.

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MEDICINE

Seek Anti-Aging Chemical

► **WANTED:** A chemical to break the "handcuffs" that keep protein molecules in the body from functioning. Such a chemical would stop or reverse the aging process in human bodies.

This is the theory of Dr. Johan Bjorksten of the Bjorksten Research Foundation in Madison, Wis.

Life chemistry, he pointed out, is largely dependent on protein molecules. They make up the flesh and blood and brains. They are tied together, or "cross-linked," by a number of substances which may be formed in the body. Certain kinds of such "cross-linkages," Dr. Bjorksten thinks, make the protein molecules incapable of taking further part in body processes. This leads to a slow, progressive clogging of the cells with inactive protein, in his opinion.

Dr. Bjorksten explained his theory in everyday terms as follows:

"Suppose you have a big machine shop hall where thousands of men are working. At the end of every day an evil power slips a pair of handcuffs on two of the men, so

that they are chained together. The handcuffs cannot be removed or cut with anything we know today.

"At first there won't be much change in the output of the plant, as only a few of the men are handcuffed together, but as more and more of the men get linked together, particularly when three and more get chained to each other, it becomes harder and harder for them to work, and so, gradually, the plant comes to a standstill.

"When we discover a way of opening those handcuffs, the men will soon be working again and the plant will be in as good operation as ever. That is the best comparison I can think of to explain in a simplified manner what we believe happens to the protein molecules in the body when a person ages, only we have not yet found any way to cut the handcuffs.

"First we have to find out what they are made of and how they are slipped on, then we can, we trust, find a way to cut them or to avoid them."

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MEDICINE

Juices Cause Ulcers

► **AN EXCESS** of digestive juices, not local weakness in stomach wall lining, is the real cause of stomach ulcers, Dr. Lester R. Dragstedt, chairman of the department of surgery at the University of Chicago reported.

He told the National Academy of Sciences that excess digestive juices are produced in two ways. In patients with duodenal ulcers, high secretion of gastric juice is usually of nervous origin, while in patients with gastric ulcers, hypersecretion is usually caused by high hormone activity.

Production of gastric juices for digesting food results from stimulation of the vagus nerves, which lie in the chest and upper abdominal cavity. Sight, odor or taste of food causes the stimulation. Gastric juice production is also caused by a hormone called gastrin, formed in the lower third of the stomach, the antrum, when this part of the stomach comes in contact with food.

In patients with ulcers of the duodenum, the part of the small intestine that leads directly out of the stomach, the excess gastric juice results from stimulation of the vagus nerves from the tensions and strains of modern life. The overproduction continues even when the patient is asleep and the stomach empty, and can be from three to 20 times as much as in normal persons.

Severing the vagus nerve by surgery stops the excess secretion of gastric juices and allows duodenal ulcer to heal, Dr. Dragstedt said. This is the so-called vagotomy operation which he developed.

In patients with gastric ulcers, stimula-

tion comes from the secretion of the hormone gastrin. Prolonged presence of food within the antrum, resulting from sluggish digestion or from an obstruction at the mouth of the stomach, can cause this stimulation. Two surgical methods can be used to slow down such overproduction, in which the stomach literally digests itself.

Either the obstructions that prevent the stomach from emptying itself at normal speeds can be removed or the antrum itself can be cut out to slow down the production of gastric juice by diminishing the supply of gastrin.

Dr. Dragstedt's findings account for previously baffling differences in results of surgery on gastric and duodenal ulcers, which were sometimes ineffective, or even led to new ulcers.

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MINERALOGY

Find Very Radioactive New Uranium Mineral

► **DISCOVERY** OF a new uranium mineral that is "extremely radioactive" was reported by L. R. Stieff, T. W. Stern and A. M. Sherwood of the U. S. Geological Survey in *Science* (April 22).

First collected in Mesa County, Colorado, it is named coffinite in honor of Reuben Clare Coffin of Tulsa, Okla., a geologist who has made major contributions to geology of the Colorado Plateau.

Coffinite is a uranous silicate, with the

chemical formula $USiO_4$, and contains as much as 61% uranium. Highest amounts of uranium in minerals are the uraninites, with about 85%. Attempts to make the new mineral in the laboratory have so far been unsuccessful.

The black mineral was discovered by Mr. Stieff, Mr. Stern and L. B. Riley. Besides occurring on the Colorado Plateau, coffinite has also been found in Wyoming, Arizona and several foreign countries.

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"SPRING" IN AIR — This helical pattern was made by a helicopter as it took off at night with a set of the newly developed 1,000-g lamps built into its rotor tips.

AERONAUTICS

'Copter Warning Light Can Stand 1,000 G's

► **A WARNING** lamp on the whirling tips of helicopter blades, withstanding 1,000 times the force of gravity, has been developed.

The rotor lamps will provide a distinctive circular light pattern for night-flying helicopters that could be identified by other aircraft as far away as five miles, even against a background of city lights.

Developed by Westinghouse Electric Corporation and Kaman Aircraft Corporation, the lamp contains two tightly coiled filaments.

A clear plastic housing designed to fit the contour of the rotor blade encloses the lamp. It produces 35 candlepower, but reflectors increase the effective light output approximately nine times.

Helicopters, with their unusual maneuvering characteristics, require special identifying lights to distinguish them from other aircraft. The system is expected to provide this lighting and even permit helicopter night formation flights.

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PHYSICS

Solar Power for "Mouse"

Small earth satellite could be powered by batteries that convert the sun's rays to electricity. Launched to circle earth for a short time, satellite could radio valuable information.

► A TINY earth satellite, launched in the near future to stay up for only a short time, could be powered to report observations by solar batteries, Dr. S. F. Singer of the University of Maryland told the American Rocket Society meeting in Baltimore, Md.

A sky-sweeping orbit in which the artificial moonlet would zoom from pole to pole rather than around the equator would "allow continuous production of electric power" by silicon solar batteries, he said.

An equatorial path would be easier to establish, he pointed out, but the polar orbit would allow not only power production but continuous scanning of the complete earth's surface in order to determine the amount of sunlight reflected by clouds. Such measurements would supply "the vital missing link" in computing the earth's heat balance, leading to the "possibility of predicting long-range climate for various latitude belts of the earth and for various reasons," Dr. Singer said.

Actual measurements would be very simple technically, a photocell continuously viewing the earth giving the necessary information.

Individual instruments in the small arti-

ficial satellite, called the "Mouse," would probably weigh only ounces. Thus the moonlet need not be larger than one foot both in diameter and height. With proper precautions, he said, average temperature inside the cylinder would be about room temperature.

Information about ultraviolet radiation from the sun, Dr. Singer expects, would be "the most important subject for study from a platform above the atmosphere." This is because ultraviolet radiation has such profound effects on the earth's upper atmosphere, producing several radio-reflecting layers and starting many chemical reactions.

Particles from the sun, cosmic rays, micro-meteorites, densities of the upper atmosphere and radio properties of the ionosphere could also be studied with relatively simple instruments on a man-made, short-life satellite, Dr. Singer said.

The technical problems connected with launching, control and instrumentation of the "Mouse" are "well within the range of present technique," he pointed out. (See SNL, Mar. 27, 1954, p. 197.)

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PSYCHOLOGY

Voodoo Kills by Despair

► DEATH THROUGH despair is possible. This is the opposite of death caused by extreme stimulation and excitement. Despair deaths explain mysterious hex and voodoo fatalities.

Dr. Curt P. Richter of Johns Hopkins Hospital, Baltimore, Md., told the National Academy of Sciences in Washington that he has found rats can die when placed in hopeless, helpless situations from which no escape is possible.

The same is true with human beings.

It explains the very sudden voodoo deaths of persons who have been put under a "hex," doomed by a medicine man, or who have been "cursed" by having a magic bone pointed at them.

The hex or voodoo death occurs within a few hours and takes place without a hand being touched to the victim. Scientists have believed that death in such cases results from the extreme stimulation of the body's defense mechanisms. Such deaths are much more common among very primitive people, but they have been known to occur also in civilized communities.

In mysterious suicides, when people die after taking a minimum and certainly not

fatal dose of poison, the death has a similar explanation, he said.

The similar deaths of rats also occur more commonly among very wild animals, Dr. Richter reported. If you hold such a wild rat gently but firmly in your hand, it will struggle violently for a minute or so and then may give up the struggle and, relapsing into hopelessness, die.

What happens to the rat is just the opposite of what scientists have thought occurs in the hex deaths. Instead of the heart's beating fast and wildly as it does when emergency action is required of an animal, the heart slows down to a stop when no action is possible.

Similar deaths have been noted in rats put into water in a swimming jar from which escape is impossible.

After a short violent struggle they may give up and die.

Examination of the bodies showed that the cause of death was not extreme stimulation of the sympathetic nervous system or reaction of the body to emergency but just the opposite. They are what Dr. Richter calls, "vagal deaths."

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GENERAL SCIENCE

Museum Sets Up Southwest Outpost

► A SCIENTIFIC outpost has been established by New York's American Museum of Natural History in southwestern Arizona.

Located at 5,400 feet altitude up the eastern slope of the Chiricahua Mountains in the Coronado National Forest, the Southwestern Research Station will serve as a permanent, year-round laboratory for researchers in all branches of the sciences.

Within a mile of the new station are two different types of deserts, a grassland, a woodland and an evergreen forest, harboring more than 42 species of animals, 170 species of birds and untold numbers of different plants and insects.

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ARCHAEOLOGY

Error Explains "Theft" Of Peking Man Bones

► THE ACCUSATION made recently in Communist China that Americans had "stolen" the missing bones of very ancient Peking Man has been traced to an "honest mistake" made by an English paleontologist, Prof. D. M. S. Watson of London University.

Although whereabouts of the bones is still shrouded in mystery, the piece of detective work tracking down the false accusation was done by Dr. O. G. S. Crawford, editor of the British archaeological journal, *Antiquity*.

It all began when Prof. Watson, visiting the American Museum of Natural History in New York, was shown the skull of Solo Man. This is another ancient skull found in Java. Prof. Watson mistook this skull for that of Peking Man.

Later, Prof. Watson told Dr. Walter Kuhne of Humboldt University in the German Democratic (Communist) Republic of having seen the "Peking Man skull" in New York. Dr. Kuhne passed the story along to Dr. Young of the Chinese Academy of Sciences, embroidering Prof. Watson's mistake with the additional statement that the skull had been "looted by an American soldier from the Imperial Japanese collection." It was also conjectured that the looting was carried out under orders issued by the U. S. occupation authorities in Japan.

New light on what did happen to the precious Peking Man bones—or at least what did not happen to them—is shed by Prof. Watson in the letter to Dr. Crawford in *Antiquity* (Dec. 1954) which acknowledged his mistake.

"Weidenreich," Prof. Watson's letter states, "told me not long before his death that he had been particularly careful to place them in Chinese custody and that they were being taken to Tientsin by Chinese when they were lost to sight."

Thus the Chinese should take the responsibility themselves for their loss.

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PUBLIC SAFETY

Loose Clothes Protect

► APPROPRIATELY, IN Las Vegas, calling itself the world's biggest gambling center, the four of spades and the four of hearts turned up in a surgeon's report to the thousand or more civil defense workers there to see detonation of a nuclear device.

The surgeon, Dr. Herman E. Pearce, professor of surgery at the University of Rochester, Rochester, N. Y., told of exposing these two cards and a white card to heat as intense as that of a "nominal" nuclear weapon. Object of this and his other experiments was to find how best to protect victims of such weapons from the heat effects, which could be just as deadly as the radiation.

At one distance from the heat source, the spades all burn but the hearts and white card did not. At a closer distance, the spades and some of the hearts burned but some hearts and some white cards came through all right.

This, like some other experiments, showed the importance of color for protection against the heat effects of nuclear weapons.

Layers of clothing, as well as light, or even better, white color give added protection. Two layers of cloth give much less protection than four. With six layers, there would be such great protection from the heat, or thermal, effects that survivors would

escape completely from these dangers, "to be killed by something else," Dr. Pearce declared.

The thermal effects from a nominal nuclear weapon or device come from: 1. The initial flash of very high intensity energy lasting only two-hundredths of a second. 2. The enlargement of the fireball.

The maximum burning lasts around four-tenths of a second and is complete by six-tenths of a second. These burns, because they char the skin, may look worse than contact burns, such as those from flames or steam. But "as a general statement," Dr. Pearce said, they may be less deadly than contact burns, although they will kill if they cover enough of the body surface.

Modern feminine styles of clothing, he said, would not give much protection against the burning effects of nuclear weapons. Clothing that fits tightly against the skin is not very protective.

For best protection, he advised layers of loose-fitting, light colored or white clothing.

Even a sheer stocking would be better than nothing. Some kinds of nylon, he said, would give protection. But some fabrics are flammable and the intense heat of a nuclear device might cause them to burst into flames on the wearer.

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LOOKING INTO METAL — Invisible infrared radiation is used in this modified snooperscope to investigate the structural properties of silicon. Dr. William C. Dash, General Electric Research Laboratory physicist, places silicon in the light beam from an incandescent lamp, but of the total illumination only the infrared passes through, and is converted to visible light by the 'scope.

• RADIO

Saturday, May 14, 1955, 5:00-5:15 p.m., EDT
"Adventures in Science" with Watson Davis, director of Science Service, over the CBS Radio Network. Check your local CBS station.

Mr. William C. Foster, president, Manufacturing Chemists' Association, and Mr. Cleveland Lane, assistant to the president, Manufacturing Chemists' Association, Washington, D. C., will discuss, "A Better America Through Chemical Progress."

ASTRONOMY

Moon Was Formed At Low Temperature

► THE MOON was formed at a low temperature and there has never been sufficient radioactive material there to warm it enough for melting, Dr. Harold C. Urey of the University of Chicago told the National Academy of Sciences meeting in Washington.

Evidence for this is the moon's bulge of about six-tenths of a mile which points toward the earth, he said. If the moon had as much radioactive material as has been thought, Dr. Urey pointed out, the bulge would have long ago smoothed out.

Scientists estimate the moon's radioactive material from analysis of the cosmic fragments that fall to earth as meteorites. These estimates are about three times too high, Dr. Urey believes. The lower values for abundances of potassium, uranium and thorium he suggested would account for the high rigidity of the moon.

The new, lower values would also account for the uniform composition of Mars, he said.

If the figures for abundances of radioactive materials are not reduced at least three times, Dr. Urey pointed out, one-half the outer crust of the earth would have melted in the last 500,000,000 years. This, he said, "obviously has not happened."

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CHEMISTRY

Snooperscope "Sees" Through Silicon Crystals

► A MODIFIED snooperscope is being used to "see" through silicon crystals, spotting imperfections produced in manufacturing transistors, rectifiers and other semi-conducting devices.

Polished silicon has a shiny metallic appearance and is not transparent to visible light. Infrared, or heat radiation, passes through it and is changed into visible light by the modified snooperscope, revealing the crystal structure, scientists at General Electric Co., Schenectady, N. Y., have found in their research.

When silicon is alloyed with aluminum, gold or other metals, the region around the alloy is seen to be highly strained. Study of such markings helps to control the quality of commercial silicon devices.

Science News Letter, May 7, 1955

MEDICINE

Super-Voltage Radiation Essential in Cancer

► **EXTRA-POWERFUL X-RAY** machines are now "essential" in the arsenal of weapons used to fight cancer, a panel of doctors attending the Fifth Inter-American Congress of Radiology in Washington agreed.

No matter what the voltage of X-rays used to treat deep-seated lesions, the site reacts in the same way, Dr. T. A. Watson of Saskatoon, Canada, pointed out. Advantages of X-rays produced by 20,000,000-volt machines include a low skin dose compared with a very high dose in depth, he said.

Dr. Franz Buschke, associated with the Tumor Institute of the Swedish Hospital in Seattle, noted that biological not technical difficulties, limit the number of cures in cancer treatment.

High-energy beams from the 23,000,000-volt betatron appear to be most suitable for treatment of lesions on the skin or near the skin's surface, Dr. Roger A. Harvey, director of the department of radiology of the University of Illinois Medical School, reported.

Radiologists are physicians who specialize in the use of X-rays, radium and other radioactive substances in the diagnosis and treatment of disease.

Science News Letter, May 7, 1955

MEDICINE

Treatment Before and After Radiation Works

► **SUCCESS WITH** a before and after treatment for A-bomb, H-bomb or other irradiation was announced at the meeting of the National Academy of Sciences in Washington.

The success came in studies with mice. "Highly significant survival" was obtained, Dr. Alexander Hollaender of Oak Ridge National Laboratory, Oak Ridge, Tenn., reported.

The treatment consisted in giving the mice before exposure to radiation the chemical, aminoethylisothiuronium. After irradiation, they were given daily injections of bone marrow and streptomycin.

Hybrid mice were used in the experiments. Without protection, these show "significant survival" to doses of radiation somewhat higher than 800 roentgens. With the new before-and-after treatment, there was highly significant survival from doses three times as great, 2400 roentgens.

The results show, Dr. Hollaender declared, that by proper treatment it is possible to extend the survival of mammals, which would include man, to doses higher than that usually considered lethal.

It is too early, he said, to tell what the effect of the new treatment will be in protecting against radiation-induced sterility, genetic changes, leukemia and cataracts.

Bone marrow has previously been shown

effective in giving mice some protection against radiation. Apparently when this is given after radiation and the chemical before, the effects of one add to those of the other.

The blood serum of rats, and presumably of other animals, that have been exposed to radiation all over their bodies develops some substance that will kill others, even if they have not been exposed to radiation. The existence of such a substance has long been suspected, without any direct evidence. Findings showing its existence were reported by Dr. Abraham Edelmann of Brookhaven National Laboratory, Upton, Long Island, N. Y.

Science News Letter, May 7, 1955

ANTHROPOLOGY

Italy's Greek Speech Traced to Middle Ages

► **THOUSANDS OF** persons now living in the toe of Italy's "boot" still speak ancient Greek dialects which have survived from the Middle Ages, Prof. Kenneth M. Setton of Columbia University told the American Philosophical Society meeting in Philadelphia.

This fact is evidence that for hundreds of years following the sixth and seventh centuries when the Greeks fled into Sicily and southern Italy to escape the Moslems, Italians and Greeks lived and worked very closely together.

It was this close proximity to Greek culture which was a conspicuous element in the development of the "humanism," or human self-esteem, characteristic of the Italian Renaissance, Prof. Setton explained.

Science News Letter, May 7, 1955

ORNITHOLOGY

"Best Fertilizer" Source Recovers Under Control

► **SEA BIRDS** provide Peru and Chile with a tremendous annual "crop" of the "best of all fertilizers," Dr. Robert Cushman Murphy, Lamont Curator of Birds, American Museum of Natural History, New York, told the American Philosophical Society meeting in Philadelphia.

It was generally believed that the world had lost permanently this great source of nitrogen-rich fertilizer when in the 19th century the great guano deposits located along the coast of Chile and Peru were exhausted.

But under proper management the guano beds have staged a remarkable comeback, Dr. Murphy told the meeting. The first year the deposit was under the semi-official Compania Administradora del Guano the yield was 23,790 metric tons. In 1954 the yield had gone up to 300,000 metric tons.

Chile has recently instituted control similar to that of Peru, the two national agencies working in close cooperation.

Science News Letter, May 7, 1955

IN SCIENCE

GENERAL SCIENCE

Modern Menu Misses Prairie Pups Potential

► **MODERN MAN** should be killing prairie dogs for his dinner table rather than as pests, a former president of the University of Arizona told scientists attending the International Arid Lands Meetings in Albuquerque, N. M.

"Primitive man used the rodents as an important food supply," Dr. Homer L. Shantz of Santa Barbara, Calif., stated. "Modern man has almost neglected this group as a food source except for squirrels and rabbits."

Pointing out that the prairie dog has made greater adjustments to life in desert areas than any other mammal, the California botanist explained it is not known whether the cow or sheep can produce as much food for man with a ton of grass as can the frolicsome little prairie dog.

"Rodents probably are the greatest consumers of plant material," he reported, "and on these 20,000 species, man and other carnivores could largely depend for food."

The Navajos, for example, consider the prairie dog a delicacy, but in an attempt to improve the Navajos' food supply, modern man poisoned and destroyed the rodents in their area.

"It would seem possible," Dr. Shantz concluded, "to explore this resource as a food source for man, as have the more primitive people on the earth."

The suggestion that prairie dogs be being unjustifiably passed up by man for his Twentieth Century menu was made in an address by Dr. Shantz on the history of arid land development and the problems and potentialities of these regions, which cover almost one-third of the earth's land.

Science News Letter, May 7, 1955

MEDICINE

Unborn Babies Develop Crippling Bone Condition

► **UNBORN BABIES** sometimes develop a crippling bone disease, heretofore thought to occur during the first few weeks of life.

X-ray examination of the expectant mother showed overgrowth of the fetal bones, Dr. John Caffey of New York reported to the Fifth Inter-American Congress of Radiology meeting in Washington.

The crippling bone condition, called cortical hyperostosis, is marked by an overgrowth of the outer part of the infant's bones. How the disease develops and its cause are "still obscure," Dr. Caffey said, although many cases have been reported from all parts of the world.

Science News Letter, May 7, 1955

CE FIELDS

ORNITHOLOGY

Public Asked to Help Last Cranes Fly North

► AS THE world's last flock of whooping cranes, 21 of them, headed northward from Texas, the U.S. Fish and Wildlife Service asked the public not to molest the sole survivors of a once flourishing species.

The birds are making their annual spring migration from the Aransas National Wildlife Refuge on Texas' Gulf Coast. The "whoopers" travel to Canada's northwest territory by way of Oklahoma, Kansas, Nebraska, South Dakota and North Dakota.

In making known the flight schedule of the last surviving cranes, John L. Farley, director of the Service, asked the public to give the birds every possible chance of survival.

"A safe passage through these States," Mr. Farley said, "is essential as the cranes move northward in small groups to reproduce their kind. Only by increasing their numbers can these valiant creatures win a decisive victory in the fight for survival of their species."

Wildlife experts are particularly concerned about the big white bird with black wing-tips and its resounding "whoop," because its numbers dropped from 24 to 21 last year. The Service reported that despite Federal efforts to save the unique bird, natural losses and careless or malicious gunfire have held down the growth of the world's last flock.

They are protected by Federal law.

Science News Letter, May 7, 1955

BIOCHEMISTRY

Chemical Controls Fatigue of Muscles

► USE OF muscle to do work and its recovery depends upon the chemical action of an enzyme, phosphorylase, which is found in muscle. So long as work is paced slow enough for this chemical action to be complete, fatigue does not occur.

The complicated chemical action was explained to the American Philosophical Society in Philadelphia by Nobelist Prof. Carl F. Cori, biochemist of Washington University, St. Louis, Mo.

Phosphorylase is present in muscle in two forms, Prof. Cori said. A monomeric form, with a molecular weight of 242,000, is inactive. A dimeric form, which has twice the molecular weight, is active. Other enzymes in the muscle interconvert these two forms and keep them in equilibrium.

In rat muscle at rest, the inactive form of the enzyme predominates.

When the muscle contracts at a rate of ten times per second for five to ten seconds,

the active form of the enzyme increases at the expense of the inactive form. The conversion must be very rapid because after the contraction, the active form is converted back to the inactive one. The speed with which they get back into their original balance depends on the amount and rate of the work that put them out of equilibrium.

If the muscle works for ten seconds at a rate which causes fatigue, the active form of the enzyme falls to low levels and then it may require ten to 20 minutes of rest before the equilibrium is reestablished.

But if the work is performed slowly and steadily at a rate of two contractions a second, the balance is maintained because the increase in active form during each contraction is balanced by decrease during rest periods between contractions.

The chemical reaction initiated by phosphorylase, which accompanies work of a single muscle, involves a total of 12 enzymes acting in series, Prof. Cori told the meeting.

Science News Letter, May 7, 1955

TECHNOLOGY

Invisible Holes Made By Micromachining

► MINUTE HOLES so tiny they are invisible can be made in metals with a new technique for machining by etching in an electrically conducting solution.

Dr. A. Uhler Jr. of Bell Telephone Laboratories told the American Physical Society meeting in Washington that flow of current in the solution was confined to a particular spot by a nonconducting partition, which can be a glass tube with a tip no larger than one micron in diameter.

A micron is the thousandth part of one millimeter (about 25 millimeters make one inch).

A variety of shapes can be produced by moving the tip with respect to the work. Plating with metals at a particular tiny point has also been accomplished with the technique.

Science News Letter, May 7, 1955

TECHNOLOGY

Silicon Pours From New Electric Furnace

See Front Cover

► SILICON THE element of common sand and rock used in the solar battery and the transistor, is being produced 98% pure in a new smelting furnace in Midland, Mich.

Using heats as high as 3,100 degrees Fahrenheit, quartzite rock is reduced with coke and charcoal. Dow Corning Corporation's electric furnace provides the high heat to produce silicon, second most common element on earth.

The cover of this week's SCIENCE NEWS LETTER shows molten silicon being poured amid sparks and streaks of blinding light into a cart lined with firebrick and sand.

Science News Letter, May 7, 1955

AGRICULTURE

North Africans Find Roman Ruins and Water

► WHEN IN Tunisia, do as the Romans did. This is what today's North Africans do to find fresh water and plant new crops, a French engineer disclosed.

Many wells and hydraulic works are located each year by finding Roman ruins along the Mediterranean, Jean Tixeront, chief engineer of Public Works in Tunis, told the International Arid Lands Meetings in Albuquerque, N. M. Ancient artifacts offer another clue to the location of underground water. Mr. Tixeront reported that olive trees were planted in the coastal Sfax area only after very old oil-presses were found there.

The French engineer also stated that automatic weather stations might be both necessary and a solution to the upkeep of lonely scientific desert outposts.

To illustrate the problems confronting humans operating desert climate stations, he said that wandering nomads, "intending no harm," sometimes take away scientific instruments for use as housekeeping objects.

It is difficult, too, to keep a water-flow observer on the job, Mr. Tixeront noted, for "when he has observed a river during a few months without having seen any flow, his attention (wanders) and he will possibly be absent at the very moment there is something to be noticed."

Science News Letter, May 7, 1955

BIOLOGY

High Pressures Cause Molecules to Roll Up

► UNDER HIGH pressures, large molecules of the living organisms such as enzymes and proteins tend to roll up into a globular form that occupies less space.

As pressure is reduced or temperature increased, the molecule unfolds and takes up a greatly increased volume.

This effect of pressure was described to the American Philosophical Society in Philadelphia by Prof. Frank H. Johnson, Princeton University biologist.

Such narcotics as alcohol, ether or urethane act as does high temperature to favor the unfolded state of larger volume in the large molecule, Prof. Johnson said.

Thus the effect of high pressures on biological molecules can be modified by temperature, drugs or other chemicals.

The high pressures discussed by Prof. Johnson occur in nature only in the cold depths of the sea and in the hot brines of deep oil wells. They have recently been reproduced in the laboratory, however. A great variety of life processes, including growth, cell division, respiration, muscle contraction, nerve function, and photosynthesis, have been modified, sometimes reversibly, by pressures of a few hundred atmospheres, Prof. Johnson reported.

Science News Letter, May 7, 1955

PUBLIC HEALTH

Hazards of Smog

The problem of preventing harmful radioactive fall-out is like that of smoke control. Filters and precipitators can reclaim valuable wastes from industrial chimneys.

By HELEN M. DAVIS

► A PLUME of gray smoke curling out of a chimney used to be the symbol of home and comfort. But today a cloud of black smoke billowing out of a factory chimney pleases no one.

Hot words are flying in several localities about whose fault it is that smoke mixes with the weather to produce "smog." Each of several groups of people is trying to point to others as the real source of irritating vapors that appear mysteriously in the air with little warning.

The irritating vapors brings tears to the eyes of the man in the street. They make him cough. The lady shopper suffers the added indignity of finding her nylon stockings disintegrating into a network of "runs."

This must be a new kind of smoke. The kind that curled from grandfather's chimney didn't behave so—or did it? Grandmother didn't have nylon stockings, either. Is our new technology to blame for smog? And if so, what part of it?

Coal dust, metal fumes, acid droplets, petroleum products, both from the refineries and from exhaust gases given off by cars, trucks and buses, have all been blamed, but the scornful point also to householders who burn trash in their back yards. Everyone seems to blame the other fellow. A number of research projects have been started to try to find out what the irritating substance really is.

Coal, Oldest Offender

Oldest offender as a smoke nuisance is, of course, coal. In Queen Victoria's time in London, the government issued many regulations designed to keep coal smoke from polluting the air. These attempts at regulating combustion by law were accompanied by inquiries into the scientific causes of the "black fogs" of London. But a report to the British government by the General Board of Health in 1855 stated a conclusion not very different from the reports of similar studies which are being made today.

"Notwithstanding the great and obvious advantage of perfecting the combustion of fuel," the 1855 report reads, "and the certainty that the cost of doing so will be amply repaid by the saving effected, such is the indisposition of practical men to depart from the beaten track, that nothing but the force of law is likely to ensure the care and attention necessary to protect the public from a grievous nuisance, the manufacturers themselves from heavy unneces-

sary expense, and the national resources from grievous waste of fuel to the amount of millions a year."

The "care and attention" urged by this Board of Health consisted of better regulation of drafts and dampers, and taller chimneys to spread the smoke higher above the roofs. Many of the control measures advocated today are asking for the same better drafts, taller chimneys.

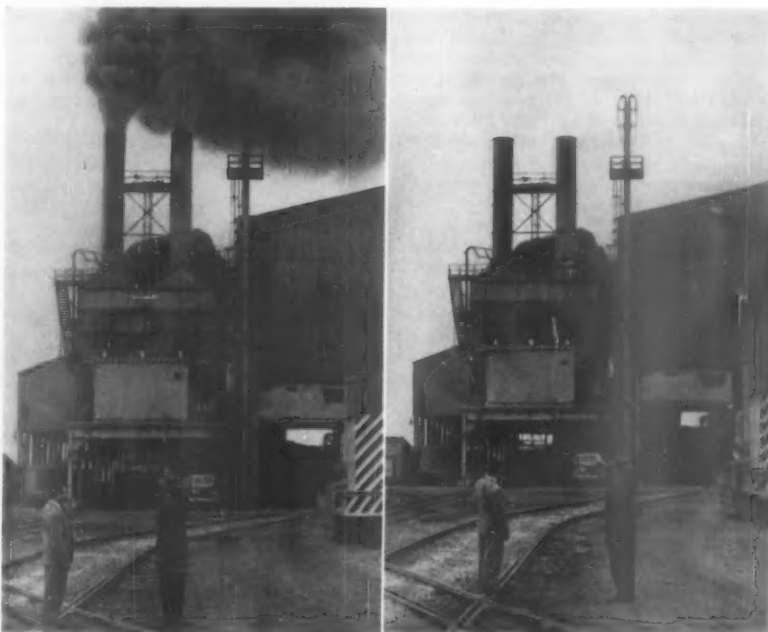
When coal is burned with a good draft of air, the black fuel is entirely consumed. Carbon dioxide, a colorless, odorless gas, goes up the chimney. Whatever rock-like material was quarried and shoveled into the furnace along with the coal is left behind as the ash.

When coal is burned with less than enough air for complete combustion, carbon monoxide, a deadly poison, is formed with or instead of the dioxide. Along with these hot gases, fine coal dust rides the draft up the chimney, and pours out as a black cloud that hovers in the upper air until spread by the wind.

Sooner or later, these fine, solid particles settle back to earth, and coat the housewives' possessions with a film of sticky black dust, no matter how carefully they were put away.

Black coal dust was believed to be the chief offender in smoke studies until, in the early part of the present century, Frederick G. Cottrell devised a means of giving a static electric charge to dust-carrying gases escaping from industrial chimneys. When this process of electrical precipitation was put into use, all sorts of valuable by-products, including sulfur compounds, potassium salts, volatile metals, and many others, were recovered from industrial stacks. These materials were saved from becoming a nuisance, and returned as money in the pocket to the manufacturers. But there were still "practical men indisposed to depart from the beaten track."

Gradually, however, sentiment built up in favor of cleaning up the air over industrial cities. Pittsburgh and St. Louis are among those which have made notable improvement. But industrialization has spread into new areas, and many new products find their way up industrial chimneys. Frantic speed-up during the war years allowed some laxity from the best practices of smoke control.



SMOKE CONTROL—Clouds of smoke billow from the chimneys of this industrial plant when the smoke abatement apparatus is turned off (left), but with the flick of a switch this nuisance vanishes (right). Such smoke control installations help avoid danger of smog.

Hazard of dirt, suffocation and poisoning from carbon fuels and industrial wastes has been with us a long time. Measures have been devised which, if conscientiously carried out, can be protective. Filters and "scrubbers" supplement electrostatic precipitation. Air contamination can be kept to a minimum when a really concerted effort is made to do it.

With the introduction of nuclear fuel into industrial power plants, hazard is increased by a new dimension of danger. Just as the film of black dust from carbon-burning furnaces permeates everything, to the housewife's despair, a similar fall-out comes from the tall stacks of atomic energy plants.

Invisible Dust

This dust is colorless, and so fine as to be nearly invisible. It adds to the total of radioactivity in our surroundings. On account of the increasing amount of radioactivity in this atomic age, we may all come to wear the indicating badges now used only in laboratories dealing with radiations on a large scale.

The mere fact that radioactive material is abroad in the air need not necessarily cause alarm. The important question is how radioactive. For the answer, sensitive instruments must be used, for we are blind, deaf and insensitive to this hazardous dimension of matter.

The "practical man" who is ignorant of the danger may disregard the advice of experts if he is allowed to. He may locate his atomic energy plant where moisture and prevailing air currents could join forces to produce the ultra-modern horror, a radioactive smog.

The seriousness of even ordinary air pollution was brought home to the American people by a spell of smog in Donora, Pa., one October day in 1948 which cost the lives of many people. "Temperature inversion" as a factor in smog formation became a familiar term when studies of this catastrophe were published.

Temperature Inversion

Normally the temperature of the air becomes lower the greater the distance above the ground. But when cool air slides under a layer of air that is warm and moist, especially after several hot, muggy days with no wind, this temperature inversion causes the fog that, mixed with smoke, becomes smog.

Deep narrow valleys are especially liable to temperature inversions in the autumn. Once a pocket of stagnant air has formed in this way it tends to remain until some decided change in the weather breaks it up. Locations where temperature inversion occurs frequently need more than tall chimneys to solve their smoke disposal problems.

The Los Angeles-Pasadena area in California is one where smog conditions occur. In September, 1946, on Friday the 13th, as it happened, a particularly bad smog was impolitic enough to occur on the very day the city fathers had chosen to open a clean-up-your-city campaign. "Black Friday," as

this day of smog is remembered, started controversies over who is to control whose smoke that are still raging.

Research programs have been undertaken to try to find the substance in smog that causes eye irritation. Such suspects as acrolein, hydrogen persulfide, elemental sulfur and mineral oil droplets have been squirted at volunteer martyrs to science. Tears have been shed, but the ultimate quintessence of smog has yet to be synthesized 100%.

Studies of the smog problem have turned up surprising sets of statistics of what the minor constituents of the atmosphere may be. One authority says that from one to two thousand tons of hydrocarbon materials are released into the air each day in the Los Angeles region. These hydrocarbons come from evaporation losses during gasoline manufacture and from the products of incomplete combustion in automobile engines. Other combustion processes are said to give off oxides of nitrogen to the amount of 200 to 300 tons daily. A similar amount is probably present in the exhaust gases. Ozone in the air is said to shorten the life of rubber, including automobile tires, on the West Coast more than in other places. And householders burn thousands of tons of trash.

Atomic Plants

But what of the switch to power from nuclear fission?

Atomic energy, as it is now being harnessed, substitutes the heat from nuclear fission for the heat of combustion. Combustion of coal, gas or petroleum products results mainly in carbon dioxide, a non-poisonous gas which cools rapidly to the surrounding temperature and is ultimately used by plant life with the aid of photosynthesis.

Although an atomic reaction is often called a furnace, its method of operation and its results are entirely different. When isotopes of thorium, uranium or plutonium fission, they give off in quantity new radioactive elements otherwise so rare as to be almost non-existent. These bring only trouble to the plant or animal that assimilates them.

These fission products are "hot" in the sense of the physicist's slang, meaning that they are disintegrating by giving off a great deal of atomic radiation. If they give this radiation off fast, anything in the neighborhood receives a lot of radioactivity in a short time. This can be very harmful. If, on the other hand, fission products are formed which give off their radiation slowly, it will last a long time. Some radioactive isotopes recently set free in the world will take a longer time to die down to relative inactivity than the time man has inhabited this earth so far.

The effect of radiation on man or other living creatures adds up. But the sum is an algebraic one, with plus and minus terms. Every cell is constantly turning over a great number of atoms, building food into its structure, discarding wastes. Thus even

Continued on p. 300

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Hazards of Smog

Continued from p. 299

a relatively heavy dose of radiation can be repaired quickly if stable atoms are available to replace the "hot" ones. But the body can make no choice in this matter, for it has no way of distinguishing between a stable atom and a radioactive one of the same species.

The body does not even use much discretion in distinguishing between atoms of chemically similar elements. It will build a handy atom of radioactive strontium, a dangerous fission product, into living bone instead of the more normal stable calcium. That strontium atom will bombard all the tissues around itself with its radiations, and may stay in the bone for a long time.

Every radioactive isotope has its own characteristic rate of disintegration. All disintegrate according to the same law. Half of the radioactivity dies away in a period of time peculiar to that atomic species of element. For one the time may amount to microseconds, for another thousands of years. There are all sorts of rates in between.

Many fission products have short half-lives and are very "hot." One way of disposing of these, so far, is to waft them up a very tall chimney so they may be spread far and wide by the wind. Since they are very fine particles, they take a long time to settle back to earth. By that time the worst of their radioactivity has had time to die away. What is left may not be greater than the "background" in which we live constantly.

However, as atomic energy installations increase the problem will become like that from present-day industrial plants.

The potential hazard to life will be enormously greater. Today's "practical men," like those of a century ago, raise a political hue and cry against efforts to make them stop wasting their own resources. Before they are entrusted with the makings of radioactive smog, our best technical effort must be used to prevent that damage before it has a chance to happen.

Science News Letter, May 7, 1955



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Books of the Week

For the editorial information of our readers, books received for review since last week's issue are listed. For convenient purchase of any U. S. book in print, send a remittance to cover retail price (postage will be paid) to Book Department, Science Service, 1719 N Street, N.W., Washington 6, D. C. Request free publications direct from publisher, not from Science Service.

ALUMINUM PAINT AND POWER—Junius David Edwards and Robert I. Wray—*Reinhold*, 3 ed., 219 p., illus., \$4.50. Research and technological progress in this industry has made revision necessary.

AMERICAN AGRICULTURE: Its Structure and Place in the Economy—Ronald L. Mighell—*Wiley*, Census Monograph Series, 187 p., illus., \$5.00. Based mainly on the 1950 Census of Agriculture and related material prepared in the Bureau of the Census, Commerce Department and the Agriculture Department, this book is addressed to the lay reader who is interested in agriculture.

THE BIOLOGY OF THE AMPHIBIA—G. Kingsley Noble—*Dover*, 577 p., illus., \$4.95. An unabridged republication of a book originally published in 1931.

CANCER THROUGH THE AGES THE EVOLUTION OF HOPE—Francelia Butler—*Virginia Press*, 147 p., illus., paper, \$1.00. The history of our knowledge of and our superstition about cancer from Biblical times to the early part of the 20th century.

CIGARETTES = LUNG CANCER?—Pat McGrady—*Public Affairs Committee*, Public Affairs Pamphlet No. 220, 28 p., illus., paper, 25 cents. The science editor of the American Cancer Society surveys the scientific evidence in the cigarette-lung cancer controversy.

FOURTH ANNUAL REPORT ON STRESS—Hans Selye and Gunnar Heuser, Eds.—*ACTA*, 749 p., illus., \$14.34. Published annually to review the important problems and results of clinical and laboratory research in the fields of biological stress.

GREATER REUSE OF INDUSTRIAL WATER SEEN—Richard D. Hoak—*Mellon Institute*, 5 p., illus., paper, free upon request to publisher, 4400 Fifth Ave., Pittsburgh 13, Pa. By 1975 industrial water requirements will be 170% greater than in 1950, thus making industrial reuse a major factor.

A HANDBOOK OF SAILING BARGES: Evolution and Details of Hull and Rigging—F. S. Cooper—*Adlard Coles (John de Graff)*, 112 p., illus., \$2.50. Describing and illustrating the detail of hull, rig and fittings of sailing ships.

LAND JUDGING—Edd Roberts—*University of Oklahoma Press*, 120 p., illus., \$2.50. "There is no doubt," the preface states, "that land judging is as important as livestock judging, and perhaps more basic and fundamental, in this epoch of our agricultural development."

LIFE SCIENCE: A College Textbook of General Biology—Thomas S. Hall and Florence Moog—*Wiley*, 502 p., illus., paper, \$6.50. Designed to be used for a one-year biology course or a course which offers botany and zoology in sequence. Beautifully illustrated.

METHODS FOR EVALUATION OF NUTRITIONAL ADEQUACY AND STATUS—Harry Spector, Martin S. Peterson and T. E. Friedemann, Eds.—*Advisory Board on Quartermaster Research and Development*, 313 p., illus., free upon request to Quartermaster Food and Container Institute for the Armed Forces, 1819 West Pershing Rd., Chicago 9, Ill. A symposium sponsored by the Quartermaster Food and Container Institute.

MONKEYS—Herbert S. Zim—*Morrow*, 64 p., illus., \$2.00. Telling children about many varieties of monkeys found the world over.

PLASTICS IN BUILDING—Charles R. Koehler, Ed.—*Building Research Institute*, NAS-NRC Publication 337, 149 p., illus., \$5.00. Comprising the views expressed at a conference conducted by the Building Research Institute, October 27 and 28, 1954, concerning the past, present and future uses of plastics in the building industry.

POPULATION GENETICS—Ching Chun Li—*University of Chicago Press*, 366 p., illus., \$10.00. Primarily an exposition of some of the fundamental principles and theorems established in this field.

PRACTICAL ELECTROACOUSTICS—Michael Rettinger—*Chemical Publishing Co.*, 271 p., illus., \$10.00. Describes and analyzes the essential units of audio-communication equipment for those who desire to obtain a broad idea of the principles and practices of applied electroacoustics and who wish to have a variety of working formulae and design curves.

THIS IS THE BEAGLE—George D. Whitney—*Practical Science Publishing (Garden City)*, 252 p., illus., \$3.95. A veterinarian describes the care of this breed of hunting dogs from the selection of a puppy to the training of a field champion.

Science News Letter, May 7, 1955

PHYSIOLOGY

Bird's Eyes Superior But Man Uses His Better

► SOME BIRDS have far better eyes than does man, Prof. Samuel R. Detwiler of Columbia University told the American Philosophical Society in Philadelphia.

But man can make far better use of his eyes because they are connected to a brain with superior visual cortex which enables him to make visual judgments and interpretations impossible to the bird, Prof. Detwiler said.

Many deviations in the structure of the eye in various animals, birds and fishes fit these creatures for their different environments, he said, particularly the light-collecting devices of night-prowling animals.

Science News Letter, May 7, 1955

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GENERAL SCIENCE

China Presses Scientists

Survey shows that top scientists in Communist China are being brain washed. Most of them are not Communists, but must accept the Party line or face the consequences.

► THE LEADING scientists in Red China, most of whom are non-Communists and U. S.-trained, are being brain washed.

This is a conclusion of a partial survey on China prepared for the Center for International Studies at the Massachusetts Institute of Technology in Cambridge, Mass., by Dr. Walt W. Rostow, professor of history.

The survey reveals that these scientists, who were successfully wooed and won over to the Reds soon after the end of World War II, now find themselves in the position of conforming to the Party line or facing the consequences.

The hopes which led many scientists to remain with the Communists, the MIT survey notes, have not been realized. Pointing out that some of the most prominent Chinese scientists have been strangely silent, the survey states that "helplessness and acceptance of authority" may now characterize their situation.

It was only after the war that the Communists successfully appealed to the Chinese scientists and special inducements to keep them in Red China or return to the mainland met with "phenomenal success."

But gradually, the scientists have been forced to give up their non-Communist islands in a sea of Party politics and put up with increased official interference. Although their lot has been better than that of their colleagues in the social sciences and some still hold responsible positions in the government, isolated cases of self-criticism and public confessions have become evident. One prominent American-trained scientist was done away with, apparently, says the report, because of his refusal to sign an Anti-American declaration.

"More generally," reports the survey, "the most serious challenge to these scientists, a challenge to truth itself, on which these men have built their lives, is the Communist

concept of science as the servant of political and social expediency. Attacks on 'bourgeois science' commonly appear when scientists do not serve these purposes as the Communists see them."

Dr. Rostow likens the use of the humans for Red China's peacetime construction projects to the tactics the Chinese Reds employed on the battlefield. Stating that they rely more on great masses of humans to perform the heavy labor than on technical know-how, Dr. Rostow calls it "a sad day for the 'bourgeois scientists' who must sit inactively watching the wastefulness of the Communist military tactics of organizing masses to perform unskilled tasks."

Science News Letter, May 7, 1955

AGRICULTURE

Spaniards Started Continents' Soil Abuse

► THE SPANIARDS who settled the Americas, unsettled the land, a Mexican archaeologist told the International Arid Lands Meeting in Albuquerque, N. M.

"There is no doubt that in many districts the exploitation of land might have resulted in serious depletion and destruction of soils," Dr. Pedro Armillas of Mexico City said, "but the wholesale damage seems to have been a result of the technological changes introduced with the Spanish conquest."

The pastoral life, dependent on the raising of grazing animals and which might have notoriously harmful effects on soil conservation, was not found in pre-Columbian America, Dr. Armillas said.

At the time of Columbus, Dr. Armillas reported, Indians from southwestern United States to northwestern Argentina planted floating gardens, called chinampas, built rock walls, dug wells, irrigated and practiced contour land terrace farming. But the Spaniards ended many of these practices.

They stripped forests for mine-timber, introduced herds of grazing animals, changed the cultivation practices from intensive to extensive by introducing the plow, unbalanced the population by moving them and finally, "the decrease in population resulting from the epidemics introduced by the Spaniards brought about the abandonment of pre-Spanish irrigation systems."

Applying the historical causes of land misuse to today's technical aid programs, Dr. Armillas warned that "whatever may be the technical value of programs of aid, these may run the risk of failure if they do not take into account the cultural conditions."

Science News Letter, May 7, 1955

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Tulip Tree

► ALL THROUGH the whole eastern part of the United States, and well into the West where men have seen fit to plant them as ornamentals, tulip trees are coming into bloom. It can be spotted as a somewhat rough-barked but tall and stately tree, big as a cottonwood, with a vast bed of flowers plucked up off the ground and scattered carelessly about over its crown.

Although the gorgeous magnolias of the South do not venture very far north, the tulip tree, a fairly near relative, upholds the family traditions through a wide stretch of country well above the Mason-Dixon line. West of the Mississippi it occurs naturally little if at all, but will thrive as a cultivated tree as far west as one can grow six-foot cornstalks, and it deserves wide acquaintance. It does receive full appreciation in the cities of the East, however.

Its only drawback in the windy stretches of the prairie states is that winter storms will sometimes break off branches, for the wood is short and rather brittle.

Though this weakness of its wood precludes it from consideration as a first-rank hardwood, the tulip tree still has a useful place as a timber producer. Its fiber is even and smooth and rather soft, which makes

it nice material for the veneer knife. For this reason, and because it is a fast grower, the tulip tree is being cultivated to some extent on cut-over lands as a regular timber crop.

The tulip tree is also variously known as tulip poplar, yellow poplar, whitewood and fiddle-tree. The latter name is in recognition of its very odd leaves, which with their squared or slightly bifurcated ends and constricted sides have some faint suggestion of a violin shape about them. The Greek name which Linnaeus gave it, however, is a bit of classic poetry to the sensitive ear—*Liriodendron*. It means "lily tree."

The beautiful flower-cups whence the tree gets both the commonest of its common names and its classical title are of about the size and shape of tulips, and have colors that no tulip need be ashamed of. In their internal structure, however, they are quite different. Instead of the triple arrangements of stamens and pistil parts, they have indefinite numbers arranged in spirals. This is a mark of relatively primitive rank in the evolutionary scale of plants; and, indeed, the tulip tree is placed by botanists very near to the front of the book, along with its magnolia relatives.

Science News Letter, May 7, 1955

METEOROLOGY

Cosmic Rays Charge Rain

► COSMIC RAYS zooming down through the atmosphere cause ions that give raindrops their electric charge, the National Academy of Sciences was told.

Dr. Ross Gunn of the U. S. Weather Bureau outlined his theory of electrification of clouds and raindrops to the meeting of the nation's top scientific body in Washington.

It is the first simple explanation for the previously puzzling facts concerning atmospheric electricity.

His theory is based partly on studies made with a giant weather globe, 60 feet in diameter, built near Houston, Tex., in which artificial clouds were made and carefully examined under controlled conditions.

Radioactive material in the earth's surface, even the tiny amount breathed out by people, adds to the ions that cause atmospheric electricity, Dr. Gunn pointed out.

When rain falls, it usually has about an equal mixture of positive and negative charges. The total amount of this electrification is very high, about 7,500 volts per inch. This is a "very large part"—about one-fifth of the total charge that air can stand without discharging, or breaking down.

Dr. Gunn computed statistically how a mixture of ions, electrically charged atoms produced by cosmic rays, would affect tiny rain droplets.

In a cloud, these ions would hit the droplets about once every five to ten seconds, the chances being equal that the charge given to the droplet would be positive or

Questions

AGRICULTURE—How are the ancient Romans helping present-day Tunisians? p. 297.

□ □ □

BIOCHEMISTRY—Use of muscle and recovery depends on the chemical action of which enzyme? p. 297.

□ □ □

MEDICINE—What causes the excess of digestive juices, believed to be the cause of ulcers? p. 293.

□ □ □

PSYCHOLOGY—How are the strange deaths "caused" by hexes and voodoo explained? p. 294.

□ □ □

PUBLIC SAFETY—How is asphalt used in the Nevada atomic explosion tests p. 291.

□ □ □

Photographs: Cover, Dow Corning Corporation; p. 291, Corning Glass Works; p. 293, Westinghouse Electric Corp.; p. 295, General Electric; p. 298, Fremont Davis; p. 304, Audio-Master Corp.

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Breaking into the movies

Madison Avenue is a thoroughfare in the Borough of Manhattan, City of New York, and a place-symbol for the art practiced there of creating your neighbor's aspirations and anxieties. (Not yours, your neighbor's.) Appropriately housed at No. 285 is the headquarters of the Association of National Advertisers, to which belong about 500 of the principal corporations that endeavor successfully to preserve the economy from stagnation.

In this endeavor it appears that money is spent like water. Millions for a single television comedian. Millions for microwave relay networks, for costumes and sets, for writers of international repute, for multi-page, multi-color inserts in magazines of multi-million circulation, for mountainsides of timber converted to coupons and point-of-purchase displays, for neon waterfalls and consulting psychologists and puppeteers.

Yet in their madness there is method. No super-cyclotron builders ever had crueler fiscal watchdogs to placate. No civil engineers ever had more faith in figures than these watchdogs.

We wish now to draw attention to one particular set of their figures. These will interest persons who contemplate the production of a movie. Movies primarily entertain, but sometimes they exhort. Sometimes nothing else exhorts as well. Movies can exhort chairmen of boards, admirals, or 8-year-old girls. They can be subtle. They can be direct. They can put an attractive face on a complicated idea. They cost money.

How much they cost, where the money goes, how many people of what kind are reached, how they're reached, what the life span of a film is, why it's done in the first place, and a great many other questions are answered through statistics in a new book called "The Dollars and Sense of Business Films." It has well-illustrated charts and hard covers and is based on hitherto confidential data supplied the Association of National Advertisers by 67

of the nation's leading companies about 157 non-theatrical films representing a total investment of \$12,000,000.

The book is available for \$5 from Association of National Advertisers, located, as we said, at 285 Madison Avenue, New York 17, N. Y. By helping publicize it, we hope to assist anyone with a big story to tell. This is little enough for us to do. The movie business is a very good customer of ours.

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Prices quoted are subject to change without notice.

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❁ **WATER-PROOF** wrist watch has been slenderized to reduce its thickness by one-third. Key to the watch-reducing technique is a gasket six times the thickness of a human hair that seals out moisture. Both crystal and back are snapped into place, and watches are stylized for work and dress.

Science News Letter, May 7, 1955

❁ **NON-MELTING "ice"** can turn an ordinary shopping bag into a portable refrigerator. Sealed in flexible plastic, the cooling agents are said to be harmless and will not flow. Three one-pound bags do the work of 15 pounds of ice for picnics, travels or camping jaunts. Available in eight sizes, they can be frozen and refrozen.

Science News Letter, May 7, 1955

❁ **CERAMIC PHONOGRAPH** cartridges come in two basic types: a single needle "pickup" for either microgroove or older 78 rpm machines, and a two-needle cartridge for playing all record speeds. The ceramic cartridges are described as in the do-it-yourself class for assembly and installation, and provide inexpensive hi-fi performance.

Science News Letter, May 7, 1955

❁ **RECORDED MUSIC** providing up to eight hours of uninterrupted playing is contained in a sound book that measures



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Science News Letter, May 7, 1955

❁ **MODERN FRAMING** in a jiffy is the boast for a frame-it-yourself assembly. A picture to be framed and mounted is sandwiched between the provided mount board and a glass. Clear butyrate plastic strips then are clipped into place around the four sides. Strips fit tightly into scored grooves and are already mitered at the corners.

Science News Letter, May 7, 1955

❁ **HAMMER-TOOL KIT** imported from Germany contains seven different tool heads made of steel that lock in the handle for use. Designed for household repairs, the car or hobby work, the kit contains a three-inch saw blade, wood drill, chisel, large and small screw drivers, an awl, and a hammer with a nail remover claw. Overall length is 6 and ¼ inches.

Science News Letter, May 7, 1955

❁ **ELECTRIC DRILL** has been equipped with a built-in work light to permit work in dark, hard-to-see places. The standard duty, ¼ inch drill also has a lock action trigger switch, pistol grip handle and weighs only three pounds. The built-in light eliminates the need for bulky drop cords.

Science News Letter, May 7, 1955

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Science News Letter, May 7, 1955

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Do You Know?

Per capita consumption of eggs last year in the U. S. was estimated at 412, about a dozen more than in 1953.

The smallest known fish is the *Pandaka pygmaea*, about the size of an ant and almost transparent.

The Air Force has developed a target that can perform evasive maneuvers while being towed at 500 miles an hour as far as two miles behind another plane; it lands safely with the aid of a parachute.

Surgeons are testing the possibility of replacing parts of major arteries in animals with dried frozen arteries from other animals, and with cloth tubes made from synthetic fibers.

Science News Letter, May 7, 1955